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ABSTRACT

This paper examines educators' interest in fostering critical thinking behaviors in relation to other "process education" concerns. It presents a definition of critical thinking and then uses that definition to classify and evaluate the literature on critical thinking, logical thinking, and reasoning. The paper examines essays, research studies, tests, and instructional materials on the basis of whether they view critical thinking as an act of inquiry, as an act of evaluation, or as a synthesis of these two processes. Finally, it offers a number of conclusions, among them that critical thinking, as a goal of instruction, should be translated into a set of "context specific" performance skills that facilitate students' performance on real life problems and decision-making tasks. (Author/RL)

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CRITICAL THINKING AND INSTRUCTION: A REVIEW

Publication No. BI-1

by

JOHN W. THOMAS

and

BEVERLY LOY TAYLOR

1975

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TABLE OF CONTENTS

INTRODUCTION..... 1

A DEFINITION OF CRITICAL THINKING..... 3

STUDIES AND PROJECTS IN CRITICAL THINKING..... 9

EVALUATION OF CRITICAL THINKING..... 13

THE DEARTH OF CRITICAL THINKING CURRICULA..... 15

CONCLUSION..... 21

REFERENCES..... 24

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Abstract

Educators' interest in fostering "critical thinking" behaviors is examined in relation to other "process education" concerns. A definition of critical thinking is offered. This definition is subsequently used to classify and evaluate the literature on critical thinking, logical thinking and reasoning. Essays, research studies, tests and instructional materials are examined on the basis of whether they view critical thinking as an act of inquiry, an act of evaluation or as a synthesis of these two processes. Finally, a number of conclusions are reached, e.g., critical thinking, as a goal of instruction, should be translated into a set of "context specific" performance skills which facilitate students' performance on "real life" problems and decision-making tasks.

Introduction

The impetus of the curriculum reform movement of the past fifteen years has turned minds towards "process education," teaching students how to think, and setting up practical experiences so that students can define and carry out their own research. Even before this most recent shove in the direction of processing information, any investigator would have been hard pressed to find disagreement that an important goal of education is to teach children how to think. While there is little argument on the name of the game, there is much contradiction and confusion on how to play it. The largely unmapped territory of thinking may be one of mankind's last frontiers.

Knowledge of this extraordinary capability which separates humans from others of the animal kingdom remains a jungle of disconnected, though often laudable, ideas, theories and guesswork. After all, one cannot conclude from a wrinkled brow or a thoughtful expression that thinking is in fact taking place; one can infer only from observable behavior in situation requiring thought. We cannot see the intellect in action in the same way that we can view the movements of our bodies. We must speculate as to the construct, range and sequence of our mental activities. Some investigators (Burt, 1949; Guilford, 1956) have hypothesized constructs of the mental processes, which at least offer insight into the many factors involved in intelligence. Guilford, for example, has isolated 120 separate abilities along the three major dimensions of operations (intellectual processes), contents (modes of representing information) and products of

these operations upon the content. Regardless of criticisms of validity and predictive qualities, Guilford's "structure of the intellect" has spawned the development of instructional objectives from its various cells (e.g., Karnes, 1970; Meeker, 1969) and acquainted us with the complexity of the intellect.

Other exploratory efforts have taken the road of classifying cognitive processes according to task analysis; that is, describing the necessary performances for completing a task. Examples of this approach would include Bloom's taxonomy of educational objectives (1956) and Gagne's cumulative learning model (1970). Neither is a model of thinking, but both have utility as educational guides in designing curricula and instructional objectives. Still other routes to the understanding of this fertile area have involved the development of information-processing models, such as Fletcher's (1969) and the TOTE Unit (Miller, Galanter and Pribram, 1960), or problem-solving models, e.g., Dewey's five-step approach, all of which attempt to delineate the logical steps composing a complex thinking act so as to teach problem-solving strategies to children. Of this approach, Russell (1960) writes:

> Recent work suggests that enumeration of stages is at best a primitive description of a subtle process and that the sequence of any pattern of stages shifts rapidly without a general clear-cut series of events always in operation. (p. 647)

All of the signposts into this land are tentative and subject to interpretation and argumentation. An instructional charting of the thinking domain can allow educators to move from the well-tilled area of teaching facts and content to this fallow region of teaching cognitive processes

for use in a dynamic, changing society. Previous forays into this field so overlap and duplicate one another that Bloom and Rakow (1969) have stated:

> This is a difficult field to organize. The terms are different for various workers, the studies are rarely cumulative or even addressed to common problems, and only recently have workers in the field been meeting each other in face-to-face conferences. (p. 600)

Thus, in spite of the many inroads so far, visibility still is limited in this foggy landscape. This being the case, it is no surprise that little progress in the teaching of thinking has occurred. It has been pointed out, by way of further explanation, that teachers are not trained to teach thinking, that there is a general belief that thinking occurs naturally without training, and that many educators believe that the larger population is incapable of reflective thought and therefore not trainable (Burton, Kimball and Wing, 1960). Let us, then, rope off one province, that of critical thinking, and inspect it more closely.

A Definition of Critical Thinking

Variously referred to as reflective, clear, or "straight" thinking and often connected with inquiry and problem solving, critical thinking is considered to be one of the higher order cognitive processes. A dictionary definition of the word "critical" puts forth the idea of careful analysis and judgment for the objective determination of merits and faults. Donald Johnson (1945) states:

> As differentiated from other higher mental processes, judgment is decisive, not productive. It is decisive in a functional sense in that it closes an episode of deliberation and permits the resumption of other kinds of activity. It is not productive since nothing new is added to the perceived situation as by imagination, memory or generalization. (p. 193)

Although Reitz (1952, p. 542) would disagree regarding the productive qualities of judgment, others concur. Guilford describes and differentiates five types of thinking in his "structure of the intellect" -- memory, cognition, convergent production, divergent production, and evaluation. About the evaluation component, he says:

> A fifth group has to do with evaluation, which, in more familiar ways of speaking, means critical thinking. We continually evaluate what we know, what we recall, and what we produce by way of conclusions. (p. 177)

For Guilford, as for others, evaluation is concerned with judgment, i.e., decision making, not with production, even though something of a case might be made for viewing the judgment as the product of the judging process, as does Reitz. Judgment, according to Reitz, "is the most important form of the higher mental processes as far as human activities are concerned" (p. 542) because it involves the examination of <u>two</u> referents, the second of which is a standard or norm by which a comparison is made with the first. Thus, he concludes that the term "critical thinking" is an accurate one.

Nevertheless, critical thinking has amassed a number of meanings in the educational community; it is a term that has been applied to such diverse areas as formal logic, paragraph comprehension, the scientific method, and the inquiry approach. In his review of the thinking processes, Russell (1965) summarized the diverse interpretations given to critical thinking:

> It has been made synonymous with the ability to abstract and organize information, to draw inferences, to search for relevant materials, to evaluate data, to compare sources, to employ a from-Missouri attitude, to distinguish fact from opinion, to detect propaganda, and to apply the rules of logical reasoning. (p. 14)

Furthermore, after surveying the literature, Allen and Rott (1969) report that:

> Critical thinking has been associated in whole or in part with problem solving, creative thinking, reflective thinking, logical thinking, reasoning, evaluation, associative thinking, and judgment. So dense is the semantic jungle in which these terms reside that some have sought out new terms less burdened by previous semantic confusion. Thus, Kurfman adopted the term "effective thinking" and Smith and Tyler chose "clear thinking" as different labels for essentially the same process. Others have expressed preference for "straight thinking," "sound thinking," and "rational thinking." (p. 14)

With this plethora of associations, it is little wonder that confusion is the keyword in an area that, ironically, is composed of analytical and logical skills.

Allen and Rott have, perhaps, snipped away some of the tangles by dividing critical thinking literature into three major approaches: An act of evaluation; an act of inquiry; and a pluralistic act, which synthesizes evaluation and inquiry (pp. 2-5).

1. Critical thinking as evaluation.

Viewing critical thinking as evaluation, Russell (1960) writes:

> Critical thinking...is a process of evaluation or categorization in terms of some previously accepted standards. It is a logical examination of data which avoids fallacies and judgments on an emotional basis only. (p. 651)

Allen and Rott point out that these standards of assessment often are drawn from the traditional rules of logic (p. 3). Kolesnik (1964) suggests that a reorganization of concepts occurs for purposes of evaluation and adds that the ensuing judgment involves the assertion, denial, or comparison of the merit or value of the subject at hand (p. 234). Unlike his

loquacious colleagues, Ennis (1962) views critical thinking simply as "the correct assessing of statements," which, he explains in a footnote, was derived from B. Othanel Smith:

> Now if we set about to find out what...(a) statement means and to determine whether to accept or reject it, we would be engaged in thinking which, for lack of a better term, we shall call critical thinking. (quoted in Ennis, p. 83)

Although Ennis' notion offers the utmost in simplicity, some question might be raised as to what "correct" means. Ennis, of course, refers to the use of conditional logic in assessment, but it seems implausible to apply the same standards, however logical, to every situation viewed by every critical investigator. Indeed, Kolesnik, in his discussion of the establishment of criteria, points out that "it is often taste or opinion, rather than absolute certitude, that A, B, and C, rather than D and E are the most valid hallmarks" in controversial issues as might be found in advertising, politics, or newspaper editorials where disagreement is common (pp. 234-35). To a certain extent, then, criteria are peculiar to the area or the individual making the judgment.

2. Critical thinking as inquiry.

This discussion leads us to the second category, that of critical thinking as an act of inquiry. Budmen writes:

> Our students need to be taught and can be taught that there are problems for which there is no single solution -- only judgments and choices of alternatives. What to consider in arriving at those judgments, how to identify the alternatives and make the choices, is what the process of critical thinking is all about. (p. 3)

Budmen continues by describing what amounts to a problem-solving model; that is, he outlines the steps of identifying basic assumptions, examining all sides of an issue, reviewing possible actions and their likely results, and finally, arriving at a decision. The passage concludes with the statement that "the kind of problem best suited to the critical thinking process doesn't allow of a right answer." (p. 4). Other writers offer similar approaches, most notably Dewey (1933), Dressel (1960), and Burton, Kimball and Wing (1960). The notion of evaluation, while present, is not the thrust of their respective models. Rather, the act of inquiry, problem solving, reflective thinking, or whatever its assigned terms, takes the central position.

Explaining the difference between the two views of critical thinking as evaluation and as inquiry, Allen and Rott state:

> Critical thinking as evaluation starts with a conclusion and works its way back to the data from which the conclusios was constructed. Critical thinking as inquiry begins with data and works its way forward to a conclusion. (p. 4)

They go on to say that:

> Critical thinking as inquiry involves a work strategy predictive of sound decision-making, whereas critical thinking as evaluation involves the proper assessment of information and arguments against logical or quasi-logical norms at whatever stage of the inquiry process they may occur. (p. 4)

Other writers discussing the relationship of critical thinking and problem solving tend to view the former as a part of the latter. To wit, Johnson states that "the judging process may be a final or an imtermediary phase of problem solving" (p. 207) and Kolesnik postulates that in the same way that critical thinking involves reasoning, so does problem

solving include critical thinking (p. 235). From an instructional viewpoint, Madison seconds Smith's statement that it is possible to develop critical thinking as the result of a problem-solving approach to learning, but he indicates that critical thinking also includes personal analysis of a situation or of written or oral communications (1971, p. 1134).

3. Critical thinking as evaluation and inquiry.

Allen and Rott's view of critical thinking as a synthesis of evaluation and inquiry appears to be the most general and imprecise. Their discussion begins with a description of Kurfman's idea of effective thinking, which he splits into a creative and a critical component. Allen and Rott, however, prefer to equate Kurfman's concept of effective thinking with an overall view of critical thinking, thus falling themselves into the trap that until then they had avoided. Their interpretation is an attempt to stretch the concept of critical thinking to fit all of the corners, while it seems clear that Kurfman viewed critical thinking as only one part of effective thinking, which he deemed the generic term for the concept. Their second example of critical thinking as a pluralistic act comes from the work of Eisner (1965), who suggested four aspects of critical thinking:

1. Questing, or the pursuit of knowledge and the accompanying disposition towards wonder;
2. Speculating, or generating models to explain phenomena;
3. Evaluating ideas on the basis of logic, evidence, and language used; and
4. Constructing, or producing relationships between seemingly unrelated ideas. (pp. 627-33)

Eisner hopes that his work "may prove useful in formulating educational objectives and in constructing devices" (p. 634). In spite of the fact that the beauty of Fisner"s article is derived from its breadth and eclecticism, Allen and Rott make a strong point when they conclude that "although Eisner"s model provides few answers, it does raise numerous provocative questions" (p. 6). Eisner"s attempt to bring the concepts of problem solving, creative thinking, evaluation, and associative thinking under the s ngle roof of critical thinking is praiseworthy but, in the end, not sufficiently detailed for instructional implementation.

Of these three approaches to critical thinking, it is the first that has received the most attention. Furthermore, Allen and Rott indicated that:

> The view of critical thinking as a "process of evaluation... in terms of some previously accepted standards" has provided the strongest conceptual basis for instruction... (p. 14)

Studies and Projects in Critical Thinking

A number of studies focusing on the improvement of students' critical thinking abilities have been undertaken in a variety of areas, including logic, evaluation, inquiry and critical reading. In addition, curriculum development efforts to strengthen critical thinking skills can be found in all of the major subject areas. Most often, the instructional program objectives are framed according to the general abilities or aspects of critical thinking. These aspects may refer to such areas as conditional and deductive reasoning or may include such activities as recognizing assumptions making inferences, judging reliability of information or

testing hypotheses. Often it is assumed that if students sufficiently practice skills of analyzing proofs, applying principles of logic or evaluating syllogisms, they will be able to apply what they have learned to a wide variety of issues in and out of school.

1. Critical thinking as evaluation.

The bulk of studies and curriculum development projects approaching critical thinking as evaluation have utilized the traditional logics as standards of judgment. Thus, often under the name of critical thinking, direct instruction in the principles of formal logic has been carried out. Although this task traditionally has not met with great success, Saadeh (1969) reported significant results with a training program for sixth graders. This course of instruction covered the concrete, functional and abstract meanings of an inference, generalizations, the evaluation of an inference and testing the validity of an inference. Ennis (1971) adhered more closely to the traditional approach in his training program to teach conditional logic to children. His data support the conclusion that there is considerable conditional logic ability among six to nine year olds and that instructional materials can effect meaningful changes in the logical skills of children between six and twelve.

Research relative to the feasibility of teaching children the principles of logic, deductive reasoning, mathematical logic and relational reasoning is conducted frequently and with some temporary success. Keislar and Stern (1969) reported favorable results in teaching children the use of verbal quantifiers (all, some, none, always, etc.) when performance was measured against a control group. Roberge (1970) presented data to

show that classroom instruction in some of the valid principles of class and conditional reasoning might begin as early as the fourth grade. Also reporting good results was Hyram (1957) in his efforts to teach seventh and eighth graders the principles of logic (definition, inductive and deductive inference). Students in the experimental group who had received instruction in the rules of logic showed significantly greater gains than their matched control peers on a test of general reasoning ability, thus causing Hyram to recommend that logic be taught directly and applied to varieties of data. Henderson (1958) also reported favorable results in teaching logic to high school students, finding that such training facilitated improved achievement test scores. These studies indicate that elementary school students, as well as older students, can grasp the principles of logic. Other works, not noted here, have presented positive data from efforts with even younger children.

Major curriculum development projects utilizing standards of traditional logic include the Illinois Project on Critical Thinking (reported by Allen and Rott) which was begun in 1954 with the expressed purpose of developing methods and materials for improving students' thinking ability with principles of logic, semantics and reasoning. Smith and the project staff prepared a list of 16 specific reasoning and judgmental behaviors for students to learn. In addition, Ennis' Cornell Project on Critical Thinking, which extended from May 1962 to September 1964, caused him to set forth his 12 aspects of critical thinking (1962) having to do with conditional logic. In 1964, the Wisconsin Concepts in Verbal Argument Project (discussed by Allen and Rott) was initiated. It utilized the

informal logic system of Stephen Toulmin because it was felt to be more applicable to students' common experiences than were the traditional logics. Seventeen critical abilities were developed by the Wisconsin staff in their attempt to achieve more transfer from schoolwork to out-of-school life.

2. Critical thinking as inquiry

Approaching critical thinking from an inquiry point of view, Dressel and Mayhew (1954) initiated the Cooperative Study of Evaluation in General Education (reported by Allen and Rott), for which committees were established to investigate objectives in several areas, one of which was critical thinking. This committee developed eight clusters of specific abilities, which comprised a problem-solving strategy. Allen and Rott note that:

> An interesting outcome of the study is that all committees reconized the importance of critical thinking as evidenced by the design and development of tests for evaluation in each of the five areas other than critical thinking itself. (p. 9)

Thus, Dressel and Mayhew came to suggest that guidelines be established for modifying math, social studies and English so that they would become essentially courses in critical thinking (1954). It has been pointed out (Allen and Rott, p. 14), however, that viewing critical thinking as inquiry is not especially suited to curriculum implementation since no definite system of concepts thus far has been developed for the classroom. The implication that problem solving proceeds from one step to the next in an orderly fashion is not only too simplified (as noted earlier) but also may confuse and inhibit students who work in different ways.

3. Critical thinking as evaluation and inquiry.

Representative of the pluralistic approach to critical thinking, Allen and Rott cite the Eight-Year Study of the Progressive Education Association as a valiant but unsuccessful attempt to synthesize behavioral objectives from logic, problem-solving theory and the sciences. This project developed four clusters of abilities under the headings of Interpretation of Data, Applications of Priniciples of Science, Application of Principles of Logical Reasoning and the Nature of Proof. The study received little attention, though, presumably because of the onset of World War II at the time of its publication.

Evaluation of Critical Thinking

Methods of evaluating student acquisition of critical thinking behaviors have been sketchy. There is not a well-rounded field of available indices of students' abilities in thinking. Since no suitable ones were accessible to test the behaviors being taught, several of the previously mentioned curriculum development projects constructed their own instruments. Thus, two deduction tests came out of the Cornell Project on Critical Thinking: The Cornell Conditional-Reasoning Test, Form X and The Cornell Class-Reasoning Test, Form X. Dressel and Mayhew included a test of critical thinking in their Cooperative Study of Evaluation in General Education. Probably the most well known of the tests of critical thinking is the one produced by Watson and Glaser in 1942 and revised in 1952, which is divided into six sections: A Survey of Opinions, General Logical Reasoning, Inference Test, Generalization Test, Discrimination of Arguments

and Evaluation of Arguments. Ballou Skinner (1971) notes that Watson and Glaser considered critical thinking to be composed of the sub-abilities of inferences, deductions, recognition of assumptions, interpretations and evaluation of arguments, and they specifically designed their test to measure these aspects. Johnson adds that this instrument also tests for individual differences in the relative weights of emotional and rational factors affecting abstract judgments (p. 218). Another instrument is Wrightstone's Test of Critical Thinking in the Social Studies (1939).

In addition, Skinner cites two sources for ideas in compiling tests of critical thinking: The Thirty-fifth Yearbook of the National Council for Social Studies (1965) and Bloom's Taxonomy of Educational Objectives (1961). Finally, Dunning (1954) presented a method for constructing paper and pencil tests of critical thinking by teachers themselves.

Although there are other tests of critical thinking and those mentioned here are merely representative, the fact remains that the field of measuring critical thinking abilities still is a rudimentary one. That the concept of critical thinking itself is fuzzy and indeterminate no doubt contributes to the paucity of testing instruments. Taba (1950) pointed out that schools emphasize the same abilities that evaluation programs do and that since critical thinking has not been taken seriously by test developers, schools' evaluation of students is limited to information recall and other academic skills which do not include critical thinking (p. 48).

The Dearth of Critical Thinking Curricula

Two general areas of difficulty account for the lack of critical thinking programs in the classroom. The first has to do with traditional approaches to school curricula and methods of teaching, while the second is concerned with the notion of generalizability and transfer of training.

1. Traditional teaching methods and curricula.

Addressing himself to the question of why teachers fail to teach critical thinking, Skinner asks:

> Is it because the teacher does not understand the true nature of critical thinking, has no idea of how to go about the process of teaching for the development of critical thinking, or has difficulty in designing tests for the evaluation of critical thinking? (p. 372)

About teaching, Taba states:

> Presumably the development of critical thinking requires teachers who themselves can think. Yet, many teachers, in their own training, have never had the opportunity to do anything but follow the routines of mastering lectures, texts or sources. (p. 48)

This view was worthy of note in 1950 and remains an important issue today.

Dressel has suggested that not only does the lack of understanding of the nature of "reasoning" contribute to its absence from the classroom but several other factors are at work, including many teachers' view that learning the history of what others have thought is more important than encouraging students to develop their own ideas and, that because thinking is dependent upon knowledge (e.g., Kolesnik, Taba), many educators mistakenly believe that thinking proceeds automatically out of mastery of content (1955, p. 419).

As pointed earlier, most educators would agree that teaching students how to think is an important goal of education. Implementation is sufficiently difficult, however, to cause it to be forfeited, usually in favor of the more easily taught and tested mastery of content. Crutchfield (Rubin, 1969) complains that because the traditional curricula are so encumbered with subject matter, there is little time or energy to attend to the more advanced skills of thinking. Thus, there is a postponement syndrome evident from elementary to secondary schoolwork and, for the most part, from secondary to post-secondary programs, and even beyond that (p. 53). Furthermore, important but difficult-to-implement goals such as critical thinking often remain unanalyzed slogans, offering little help in the classroom and inviting teachers to neglect the goal or to define it in accordance with their own objectives (Osborne and Reagan, 1973, p. 263).

Aside from the already-discussed lack of consistency of terms for critical thinking and the lack of agreement regarding the nature of thinking critically, there are several other obstacles to the development of curricula for teaching these skills. Taba mentions schools' organization of teaching and curriculum. Curricula, she says, do not take account of the types of issues that could be investigated in addition to the traditional goal of amassing knowledge, so that many fertile fields for developing critical thinking go untended. Similarly, the sequence of curricula is arranged according to the procession of subject contents, while other important objectives (such as the development of critical thinking skills) are ignored. Furthermore, curricula often are organized around those facts are necessary for recall on achievement tests, and too few tests evaluate thinking skills (pp. 46-48).

Taba indicates that too often, a simplified view of critical thinking is taken, thus attempting to reduce it to a few problem-solving skills to be taught during a class period. Calling critical thinking a way of life, she makes a strong case for a comprehensive approach that would allow sufficient time for continued practice of the skills in a number of different contexts. She also notes that the sequence of the process is important and that some experiences are necessarily preliminary to others; therefore, premature "why" questions or attempted generalizations in the classroom may thwart the desired learning. Attention to learning sequences and allowing sufficient time for students to acquire and use the skills of critical thinking are essential. Her belief that critical thinking is best achieved in group situations where the exchange of ideas and gathering of background information can occur, leads her to suggest that experimentation be undertaken to discover the best way to exploit this advantage.

2. Generalizability and transfer of training.

The other part of the problem in developing students' critical thinking skills is concerned with the idea of transfer of training. An early educational view was that the classics "formed the mind" and that with enough practice of formal exercises in Latin or Greek or mathematics, a person could transfer this training to all other problems. For the most part, this formal disipline theory has been discarded; however, people in the sciences generally are esteemed as critical thinkers, presumably because they learn to approach and to work with problems in an organized, logical way. In fact, those proponents of teaching traditional logic to children with the hope of its transferral to other aspects of their lives

might be aligned with advocates of the classics-forming-the-mind theory. These investigators (e.g., Saadeh, Ennis, Roberge, Hyram, Henderson) expect too much in skills transfer; they have placed themselves and their students on a remote, academic mountain, thus requiring great leaps across the intervening chasm if the rules of logic are to be applied to common life experiences. When viewed as syllogisms or conditional reasoning, critical thinking is too far removed from the concerns of everyday life and therefore not useful to learners except in specified, academic instances. Even though these investigators experienced some measure of success in their studies of teaching logic to children, no long-range studies investigated the effects of this learning over any length of time (more than six months) or its applicability to other problems.

Modern theory of transfer (reported in Burton, Kimball and Wing) indicated that transfer is not automatic, is not dependent upon formal exercises but rather on teaching methods that provide lifelike situations, and is facilitated by teaching directly for conscious transfer (p. 290). Russell has noted that under changed conditions, knowledge is not used effectively (1960, p. 655). Still, a number of investigators have considered the possibility that some cognitive skills are sufficiently generalizable to serve as the basis for a cognitive curriculum separate from subject matter curricula. For example, Covington (1967), one of the developers of the Productive Thinking Program, argues that the analytical, synthetic and evaluative skills and strategies that form the core of this curriculum are applicable to wide areas of inquiry. Indeed, Dressel (1955) has written:

> There are aspects of critical thinking which pervade all areas of knowledge. Respect for exact information and concern about its adequacy, recognition of explicit or implicit assumptions, detection of inconsistencies, creation of new ideas, and evaluation of the adequacy or validity of a conclusion or work are involved in communication, in science, in literature, and in the arts.
>
> To be sure, there are differences between the creativity of a scientist in proposing a new theory or designing an ingenious experiment and the creativity of an artist... (p. 419)

At first glance, the generalizability of these aspects of critical thinking does not seem to be an unreasonable idea. The problem only becomes evident when one tries to derive some usefulness from a set of very general strategies by applying them in a specific context. How valuable is the phrase "evaluation of the adequacy or validity of a conclusion or work" to someone involved in the intricacies of a scientific experiment or appraising a set of poems? Its value lies only in reminding the investigator that a particular set of skills must be brought to bear on the problem. The nature of these skilled behaviors, however, remains obscure.

Approaching this problem from a slightly different focus, that is, deciding which subject areas are best suited for teaching particular thinking processes, Smith (1960) writes:

> In educational circles, the tendency has been to assume that all subjects were logically equivalent, by which is meant that the content of any subject lends itself to the development of the same habits of thinking as does any other subject... We are inclined now to think that subjects of instruction differ with respect to the intellectual operations they either require or permit -- that one subject may engage the teacher and students in operations which another subject may not require at all, or, if so, only in a loose sort of way. (p. 94)

But even in the case of various subject areas utilizing the same intellectual operations, for example, critical thinking, the process must be interpreted differently according to the peculiar needs of the area in which it is being used.

Berlak (1965) has addressed this point in his discussion of the "general-aspects view" when he cites the widespread belief that the operations of critical thinking (and reflective thinking and problem solving when seen as separate from critical thinking) are generalizable to any problem that a learner might encounter. Identifying Ennis' work as the most scholarly yet representative assertion of this general-aspects view, Berlak takes him to task because his twelve aspects of critical thinking do not meet the "ultimate" test of a set of intellectual operations; that is, "if they do not in some way help the learner to deal with issues or to make sense out of his personal life and external reality, the operations are of little value" (p. 3). In additions, he lists several domains of experience in which an individual might struggle with problems or issues and then suggests that since there is not enough knowledge about problem solving, it is not yet possible to offer strategies to be used in all these areas of investigation. He states:

> I am struck more with the diversity and complexity of the approaches used in the various domains of knowledge than with the commonality. It is undeniable that with sufficient study we may find a high enough degree of similarity to justify a general label, but the similarity may be at such a high level of abstraction that it may be more important to pay closer attention to the differences than to the similarities, especially if we expect our students to make some use of the thinking skills we purportedly teach. (p. 7)

According to Berlak, educators wishing to teach critical thinking should study the intellectual processes and output in specific areas of experience in order to develop "context-specific" models for use in judging and improving students' work in those areas. The developers of such a model would need to demonstrate that it was of value to experts in that particular domain.

Thus, Berlak suggests that educators scuttle the general goal of teaching thinking and replace it with a "careful analysis of the thought process in the various areas of human experiences, the construction of models, and a test of their validity" (p. 12).

Concurring with Berlak's view, Allen and Rott state the importance of specifying the field in which critical thinking is to take place:

> Since it is difficult for a single set of critical thinking standards, or even a cluster of such standards, to define adequately what a person must do to be critical in all fields of human endeavor, it would seem wise to determine the particular field in which the student is to develop critical skills. (p. 15)

They recommend a model of critical thinking that explains the field of ordinary discourse; but they do not go as far as Berlak, because they group the humanities and the social sciences into this category, reasoning that these disciplines aim at gearing the student to function logically in the field or ordinay discourse.

Conclusion

The ability to function more effectively in everyday life has been emphasized as an important goal of education to which schools should give serious attention. Despite the more grandiose rationales for developing critical thinking abilities to encourage individuals' independent judgment and self-direction, to deal with a world of exploding knowledge, and to ensure informed participation in the democratic process, perhaps the most compelling reason comes from Russell (1960):

> In a world where the child gets little help in evaluating the ideas in the comic strip, the movie "epic," the advertising "pitch," and the unspoken assumptions of the TV western, it seems important that school programs give help in developing critical thinking abilities. (p. 652)

If critical thinking skills are to be taught effectively for use in such diverse areas as consumerism, reading the newspaper, law, the science laboratory, or drama, it is clear that a unitary model will not suffice. Indeed, as has been pointed out, there are several educational fronts in need of attention if the goal of teaching for thinking is to become a realistic one. What is recommended, then, is a five-pronged approach to take hold of this long-time pedagogical problem.

1. Theory. Investigators and educators interested in the field of critical thinking must reach some general agreement on the nature, shape and boundaries of what comprises critical thinking. Hopefully, they will view critical thinking in its narrowest sense (evaluation) as a tool, not a formal discipline. When treated as learned skills, critical thinking can serve as a set of objectives to guide instruction in subject or content areas.

2. Curriculum development. Efforts to develop curricula in specific content areas should be undertaken so as to identify those particular critical thinking behaviors suited to those domains. If the curricula are useful in interpreting external reality, they will be validated by practitioners in their respective areas. These curricula cannot be developed in isolation. Rather, serious study of output in each content area must be conducted in order to arrive at meaningful thinking behaviors.

3. Instructional setting. School personnel must recognize the importance of teaching thinking skills as the core of curricula and set about to ease the transition from collecting facts to learning skill behaviors. The keynote is to facilitate instruction in thinking skills, which may require schedule adjustments to permit enough time for learning and practicing them in a variety of contexts. Such flexibility may result in variable student groupings, team teaching approaches or independent project time for skills practice.

4. Teacher training. It is necessary that prospective teachers approach their own studies from a thinking perspective if they are to use such a method later in their own teaching. In addition, educational methods courses should train in ways to teach for thinking as well as for content. Furthermore, for those already teaching in the schools, training workshops and conferences will be needed to achieve a positive effect in including the teaching of skill behaviors. Obviously, this training aspect requires massive development at the university and graduate levels as well as within school systems.

5. Evaluation instruments. Only when there are adequate tests for critical thinking will instruction in these skills take place. Tests of critical thinking should be built by individual package developers as well as by separate testing agencies, ideally utilizing teams of practitioners in particular content areas and evaluation specialists in thinking skills.

Headway must be made in all five of these areas if critical thinking is to be taught as a meaningful set of objectives in a variety of contexts. This progress will not occur until educators recognize the validity of teaching students the skills needed to order their existence in a dynamic society.

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